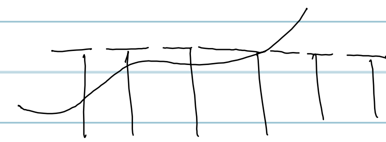
7.3 Section — Averages & Moving Averages

$$\frac{y_1 + y_2 + \dots y_n}{n} = \text{Average}$$

Average Value of a Function
= average of how high



Look @ Section 7.2 notes for hints

$$\boxed{\bar{f} = \frac{1}{b-a}\int_a^b f(x)\,dx \quad \underline{\text{Formula}}}$$

#4 Ex: $f(x) = x^3 - x$; over $[0, 1]$

Find average value

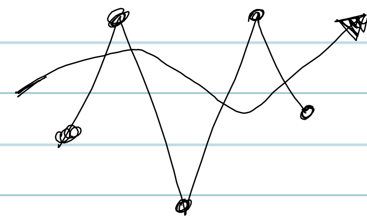
Step 1 $\quad \frac{1}{1-0}\int_0^1 (x^3 - x)\,dx = 1\left(\frac{x^4}{4} - \frac{x^2}{2}\right)\Big|_0^1$

Step 2 Can use calculator to find answer

$= -0.25$ States average is below 0 & losing money.

Concept of moving average & where we'd use it.

moving average = graph looks like



moving average tells us this

Ex: #10 looking for 3-unit moving average

x	0	1	2	3	4	5	6	7
$S(x)$	2	9	7	3	2	5	7	1
$\bar{S}(x)$			6	$6.\overline{33}$				

$\frac{2+9+7}{3}$ $\quad$ $\frac{9+7+3}{3}$

(Pg 539) Formula: moving average of a function

$$\boxed{\bar{f}(x) = \frac{1}{n}\int_{x-n}^{x} f(t)\,dt}$$

Ex: Day 7 of a 4 day moving average

7 6 5 4, so $x = 7$; $x-n = 7-4 = 3$

; $x = 7$; $x - n = x - 7$

Step 1

Δ x's to t's

#16 Example $f(x) = x^{2/3} + x$; $f(t) = t^{2/3} + t$

Step 2 $\bar{f}(x)$ w/ 5 unit average means $n = 5$

, so $\bar{f}(x) = \frac{1}{n}\int_{x-n}^{x} f(t)\,dt = \frac{1}{5}\int_{x-5}^{x} (t^{2/3} + t)\,dt$

$$= \frac{1}{5}\left[\frac{3}{5}\cdot t^{5/3} + \frac{t^2}{2}\right]\Bigg|_{x-5}^{x}$$

$$= \frac{1}{5}\left[\left(\frac{3}{5}(x^{5/3}) + \frac{x^2}{2}\right) - \frac{1}{5}\left(\frac{3}{5}(x-5)^{5/3} + \frac{(x-5)^2}{2}\right)\right]$$

$$= \frac{1}{5}\left[\left(\frac{3}{5}x^{5/3} + \frac{x^2}{2}\right) - \left(\frac{3}{5}(x-5)^{5/3} - \frac{(x-5)^2}{2}\right)\right]$$

* If we want 5-day moving average on day 240, we just let $x = 240$. *